

## REMARKS

### Status of the Claims

Claims 1 - 24 are currently pending; claim 1 is presently amended. Claims 4 - 26 are new. Support can be found for claims 4 - 8 in paragraphs [0011], [0012], and [0032]; claims 9 - 17 in paragraph [0011], [0032], [0033], [0034], and [0036]; claim 18 in paragraph [0029]; Claims 19 - 24 in paragraphs [0011], [0014] - [0018], [0034], and Table 1; Claims 25-26 in paragraph [0038]; and Claim 27 in paragraphs [0012], [0032] - [0036]. No new matter is introduced by the presently amended or newly added claims.

### Double Patenting Rejection of Claim 1 and 2

Claims 1 - 2 stand rejected under 35 USC 101 for allegedly claiming the same subject matter as Claims 1-12 of U.S. 6,897,471. The Applicants respectfully disagree.

Claim 1 of the '471 patent reads,

1. A biopolar [sic] band-to-band infrared photodetector-diode, or laser diode, or light-emitting diode, or amplifier, or electrooptic modulator-diode comprising

(a) a silicon substrate, wherein the substrate is doped N-type or P-type while the bapping [sic] layer is doped P-type or N-type to form an NIP or PIN diode,

(b) a strain-relaxed  $\text{Ge}_{1-y}\text{Sn}_y$  or  $\text{Ge}_{1-y-z}\text{Sn}_y\text{Si}_z$  buffered layer upon Si, known as a virtual substrate, VS wherein the VS is  $\text{Ge}_{1-y}\text{Sn}_y$  and the active region is a strain balanced type-I stack of compressive  $\text{Ge}_{1-2y}\text{Sn}_{2y}$  quantum wells with tensile Ge barriers,

(c) an active direct-bandgap region made up of a single-quantum-well heterostructure or a multi-quantum-well stack,

(d) a strain-relieved capping layer of  $\text{Ge}_{1-y}\text{Sn}_y$  or  $\text{Ge}_{1-y-z}\text{Sn}_y\text{Si}_z$ , matching the VS composition,

(e) metallic electrical contacts to the Si substrate and capping layer.

M.P.E.P 804 (II) (A) states,

*"Same invention" means identical subject matter... A reliable test for double patenting under 35 U.S.C. 101 is whether a claim in the application could be literally infringed without literally infringing a corresponding claim in the patent.*

In the present case, numerous embodiments exist which would potentially infringe Claims 1 and 2 of the instant application while not infringing any of Claims 1 - 12 of the '471 patent. For example, in the simplest embodiment, a three-layer semiconductor device consisting of a Si substrate covered by a layer of  $\text{Sn}_2\text{Ge}_{1-z}$ , covered by a layer of  $\text{Ge}_{1-x-y}\text{Si}_x\text{Sn}_y$ , would not infringe the '471 patent as it does not contain all of parts (c), (d) or (e) of Claim 1 of the '471 patent. Further, any four layer device containing the three previous listed layers plus a fourth, at any location in the stack, would infringe Claims 1 and 2 of the present application but not infringe any claim in the '471 patent. Examples of such layers could be an organic polymer, or any inorganic layer, such as Mg, Ca, Ag, Au, and Ge.

The double patenting rejection in light of Claims 1-12 of the '471 is improper, as Claims 1 and 2 of the instant application are not coextensive in scope with Claims 1-12 of the '471 patent. The Applicants respectfully request reconsideration and withdrawal of the rejection.

### Double Patenting Rejection of Claim 3

Claim 3 stands rejected under 35 USC 101 for allegedly claiming the same subject matter as Claims 1-19 of U.S. 6,911,084. The Examiner has alleged that the '084 patent claims a method comprising combining  $\text{H}_3\text{SiO}_3\text{SCF}_3$  with  $\text{KGeH}_3$  under conditions whereby  $\text{H}_3\text{Si-GeH}_3$  is obtained. The Applicants respectfully disagree.

Claim 1 of the '084 patent reads as follows,

1. A method for depositing an epitaxial thin film having the quaternary formula YCZN wherein Y is a Group IV element and Z is a Group III element on a substrate at temperature between ambient temperature and 1000.degree. C. in a gas source molecular beam epitaxial chamber, comprising introducing into said chamber:

- i. gaseous flux of precursor  $\text{H}_3\text{YCN}$  wherein H is hydrogen or deuterium; and
- ii. vapor flux of Z atoms; under conditions whereby said precursor and said Z atoms combine to form epitaxial YCZN on said substrate.

The applicants note a number of features of Claim 1 of the '084 patent with respect to instant claim 3.

First, the method deposits a thin film of a nitride composition on a substrate while the method of the instant invention produces a gaseous product.

Second, the product of the method of the '084 patent has the structure YCZN, where Y is a Group III element and Z is a Group IV element. Group IV elements include C, Si, Ge, Sn, and Pb. Group III elements include B, Al, Ga, In, and Tl. The product of Claim 3 of the instant invention is  $\text{H}_3\text{Si-GeH}_3$ , which contains two Group IV elements and no Group III elements. The products of Claim 3 of the instant invention and Claim 1 of the '084 patent are clearly not the same.

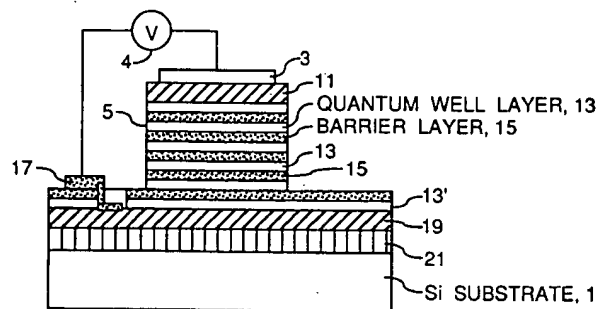
Finally, the method of Claim 1 of the '084 patent does not produce the product of Claim 3 of the instant application in any step of the process. The process of the '084 patent utilizes, (i)  $\text{H}_3\text{YCN}$ , and (ii) a vapor of Z atoms.  $\text{H}_3\text{YCN}$  includes compounds such as  $\text{H}_3\text{SiCN}$  and  $\text{H}_3\text{GeCN}$  (as claimed in Claims 15 and 16 of the '084 patent). None of these components are, nor produce in the process,  $\text{H}_3\text{SiO}_3\text{SCF}_3$ ,  $\text{KGeH}_3$ , or  $\text{H}_3\text{Si-GeH}_3$ .

The double patenting rejection in light of Claims 1-19 of the '084 is improper, as there are no embodiments of instant Claim 3 which would infringe Claims 1-19 of the '084 patent. The Applicants respectfully request reconsideration and withdrawal of the rejection.

#### Rejection of Claims 1 and 2 under 35 USC 102(b)

Claims 1 and 2 stand rejected for allegedly being anticipated by U.S. 5,548,128. The Examiner alleges that the '128 patent discloses a semiconductor structure comprising a substrate, a  $\text{Sn}_x\text{Ge}_{1-x}$  layer formed over the substrate, and a Ge-Sn-Si layer formed over the  $\text{Sn}_x\text{Ge}_{1-x}$  layer. The Applicants have presently amended claim 1 to address the rejection. As presently amended, Claim 1 is not anticipated by the '128 patent.

The '128 patent discloses a multilayer semiconductor structure, in Figures 1 and 2, as follows.



The individual components are, see Column 2, Lines 41 - 58,

- 3 - ohmic contact
- 4 - current source
- 5 - reflective end facet
- 11 - relaxed upper buffer layer (p- or n-doped, see  
Col. 4, Lines 19 - 23)
- 13 - GeSn quantum wells (QW)
- 13'- 'active QW layer'
- 15 - barrier layers
- 17 - ohmic contact
- 19 - n-doped buffer layer
- 21 - n-doped buffer layer

Of the previous components, only 11, 19 and 21 are noted as possibly containing anything similar to a GeSnSi alloy. Column 3, Lines 25 - 27,

*The strain-relieved buffer under the stack can be constructed from spatially varying (graded) composition alloy of SiGeSn.*

As such, the '128 patent discloses a semiconductor device comprising a Si substrate (1) covered by a layer of GeSn (19 or 21 or 13 or 13'), which itself is covered with a graded SiGeSn alloy layer (11).

Claim 1 has been presently amended to require that the GeSnSi layer be essentially single-phase. Support for the amendment can be found throughout the specification as filed; in particular, the Applicants note the elemental uniformity of the layer of the invention, as described in paragraph [0037], consistent with single-phase material. The '128 patent does not discuss the use of a single phase alloy layer. As such, the Applicants submit that as presently amended, Claims 1 and 2 are

not anticipated by the '128 patent, and request reconsideration and withdrawal of the rejection.

Rejection of Claim 3 under 35 USC 102(b)

Claim 3 stands rejected for allegedly being anticipated by U.S. 4,777,023; the Examiner has cited Examples 1-7 and Column 2, Lines 37-46 therein. The Applicants respectfully disagree.

The '477 patent discloses the following in Column 2, Lines 37-46 (emphasis added),

*To achieve the objects, and in accordance with the purpose of the invention, as embodied and broadly described herein, the invention comprises a method for preparing a hydride containing at least two different Group 4A atoms wherein at least one of the Group 4A atoms is silicon or germanium, comprising the steps of: (a) reacting an alkali metal and a macrocyclic compound with a silicon or germanium hydride to form a salt; and (b) reacting the salt formed in step (a) with a halide containing a different Group 4A atom.*

Instant claim 3 recites a method using  $\text{KGeH}_3$  and  $\text{H}_3\text{SiO}_3\text{SCF}_3$  to prepare  $\text{H}_3\text{Si-GeH}_3$ . One skilled in the art will readily recognize that the instantly claimed method does not use a halide as taught in the '477 patent. A halide is defined as the anion of a group VII atom (halogens), i.e. fluoride, chloride, bromide, or iodide. In fact, the '477 patent is consistent with this definition of halide, see Column 5, Line 35 - 39 (emphasis added),

*A wide variety of halides containing a different Group 4A atom can be used in practicing step (b) of the present invention. Good results have been obtained using  $\text{CH}_3\text{I}$ ,  $\text{CH}_2\text{Cl}_2$ , or  $\text{SiH}_3\text{Cl}$  as the halide containing a different Group 4A atom.*

The instant invention uses, and claims the use of in Claim 3,  $\text{H}_3\text{SiO}_3\text{SCF}_3$  (silyl **trifluoromethanesulfonate**). One skilled in the art will readily recognize that trifluoromethanesulfonate is not a halide. The applicants submit that the '477 patent does not contain all the elements of Claim 3, particularly the use of  $\text{H}_3\text{SiO}_3\text{SCF}_3$ , and thereby instant claim 3 is not anticipated by the '477 patent. The applicants respectfully request reconsideration and withdrawal of the rejection.

CONCLUSION

Applicants respectfully submit that all requirements of patentability have been met. Allowance of the claims and passage of the case to issue are therefore respectfully solicited.

If the Examiner has any questions or comments regarding this Amendment, they are encouraged to contact the undersigned as indicated below.

Respectfully submitted,

Date: \_\_\_\_\_

12/8/06

By: \_\_\_\_\_



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